# Matrix Operations and Their Applications
# Section 6.3

Learning Objectives:

1. Using matrix notation.
2. Understand what is meant by equal matrices.
3. Add and subtract matrices.
4. Perform scalar multiplication.
5. Solve matrix equations.
6. Multiply matrices.
7. Describe applied solutions with matrix operations.

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1.

$$\begin{bmatrix} 3 & -2 & 1 \\ -6 & 2 & -3 \end{bmatrix}$$

a. Give the order of the given matrix, in the form m x n.

b. Identify $a_{32}$.

c. Identify $a_{23}$.

2.

$$\begin{bmatrix} 5 & -1 & e & 9 \\ -6 & 2 & -3 & \pi \\ 8 & \frac{1}{8} & 5 & -\frac{1}{9} \end{bmatrix}$$

a. Give the order of the given matrix, in the form m x n.

b. Identify $a_{32}$.

c. Identify $a_{23}$.

3. Determine the values of x and y that make the matrix equation true.

$$\begin{bmatrix} x \\ 8 \end{bmatrix} = \begin{bmatrix} 6 \\ y \end{bmatrix}$$

4. Find values for the variables so that the matrices are equation true.

$$\begin{bmatrix} x & 5y \\ z & 15 \end{bmatrix} = \begin{bmatrix} 14 & 5 \\ 7 & 15 \end{bmatrix}$$

5. Find the following matrices where

$$A = \begin{bmatrix} 1 & 8 \\ 6 & 6 \end{bmatrix} \text{ and } B = \begin{bmatrix} 3 & 6 \\ 7 & 0 \end{bmatrix}.$$

a. A + B=

a. A - B=

b. -4A=

c. 2A + 3B=

6. Find the following matrices where

$$A = \begin{bmatrix} 5 & -7 \\ 5 & -3 \\ -2 & -3 \end{bmatrix} \text{ and } B = \begin{bmatrix} 6 & 0 \\ 8 & 4 \\ 1 & 9 \end{bmatrix}.$$

a. A + B=

b. A - B=

c. 5A=

d. 4A + 6B=

7. Find (if possible) a. AB and b. BA

$A = \begin{bmatrix} -7 & 8 \\ 2 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 3 & -8 \\ -6 & 0 \end{bmatrix}$

a. AB=

b. BA=

8. Find (if possible) a. AB and b. BA

$A = \begin{bmatrix} 4 & 4 \\ 4 & 1 \\ 4 & -2 \end{bmatrix}$ $B = \begin{bmatrix} 3 & 5 & -4 \\ -5 & 1 & 0 \end{bmatrix}$

a. AB=

b. BA=

9. Find A-C given that

$$A = \begin{bmatrix} -4 & -4 \\ 3 & 9 \\ -1 & 5 \end{bmatrix} \text{ and } C = \begin{bmatrix} -2 & -2 \\ 3 & 7 \end{bmatrix}.$$

If an operation is not defined, state the reason.

**Answer Key:**

| | | |
|---|---|---|
| 1. | a. | $2x3$ |
| | b. | Element $a_{32}$ does not exist. |
| | c. | $-3$ |
| 2. | a. | $3x4$ |
| | b. | $\frac{1}{8}$ |
| | c. | $-3$ |
| 3. | | $x = 6 \quad y = 8$ |
| 4. | | $x = 14 \quad y = 1 \quad z = 7$ |
| 5. | a. | $\begin{bmatrix} 4 & 14 \\ 13 & 6 \end{bmatrix}$ |
| | b. | $\begin{bmatrix} -2 & 2 \\ -1 & 6 \end{bmatrix}$ |
| | c. | $\begin{bmatrix} -4 & -32 \\ -24 & -24 \end{bmatrix}$ |
| | d. | $\begin{bmatrix} 11 & 34 \\ 33 & 12 \end{bmatrix}$ |
| 6. | a. | $\begin{bmatrix} 11 & -7 \\ 13 & 1 \\ -1 & 6 \end{bmatrix}$ |
| | b. | $\begin{bmatrix} -1 & -7 \\ -3 & -7 \\ -3 & -12 \end{bmatrix}$ |
| | c. | $\begin{bmatrix} 25 & -35 \\ 25 & -15 \\ -10 & -15 \end{bmatrix}$ |
| | d. | $\begin{bmatrix} 56 & -28 \\ 68 & 12 \\ -2 & 42 \end{bmatrix}$ |
| 7. | a. | $\begin{bmatrix} -69 & 56 \\ 6 & -16 \end{bmatrix}$ |
| | b. | $\begin{bmatrix} -37 & 24 \\ 42 & -48 \end{bmatrix}$ |
| 8. | a. | $\begin{bmatrix} -8 & 24 & -16 \\ 7 & 21 & -16 \\ 22 & 18 & -16 \end{bmatrix}$ |
| | b. | $\begin{bmatrix} 16 & 25 \\ -16 & -19 \end{bmatrix}$ |
| 9. | | The matrix operation is not defined. The difference of two matrices of different orders is undefined. |